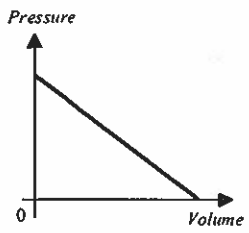
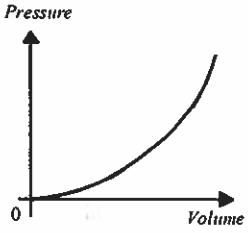
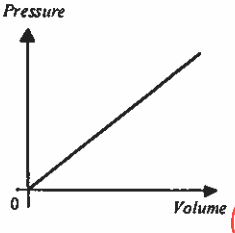
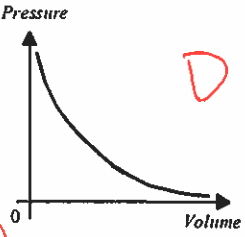
Review sheet 2 **Gas Review** Name : _____

1 Boyle's Law describes the relationship between the pressure and the volume of a fixed mass of gas at constant temperature. **Which graph describes this relationship?**

A) 

B) 

C) 

D) 

D

2 Two cylinders of equal volume contain the same mass of gas at room temperature. The 1st cylinder contains $O_{2(g)}$ and the 2nd , contains $SO_{2(g)}$. **Which one of the following statements is TRUE?**

O_2 (64g) 2mol 32g/mol 64g/mol

A) The pressure of the sulfur dioxide equals the pressure of the oxygen gas. No, contain different # of moles.

B) The pressure of the sulfur dioxide is twice the pressure of the oxygen gas. → X less

SO_2 (64g) 1mol

C) The pressure of the sulfur dioxide is 1.5 times the pressure of the oxygen gas. ×

D) The pressure of the sulfur dioxide is half the pressure of the oxygen gas. ✓

D

$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$

3 At 20.0°C, a syringe contains a given volume of oxygen gas, $O_{2(g)}$, at a pressure of 100.0 kPa. When the temperature is raised to 40.0°C while the pressure is kept constant, the volume of gas stabilizes at 20.0 mL. **What is the initial volume of the gas in the syringe?**

A) 10.0 mL C) 21.4 mL

B) 18.7 mL D) 40.0 mL

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{x}{293} = \frac{20}{313}$

$x = 18.7$

B

4 The volume of a gaseous system is 25 L at a pressure of 100 kPa. While the temperature is kept constant, the volume of this system is raised to 100 L. **What is the final pressure of the gas?**

A) 25 kPa C) 100 kPa

B) 75 kPa D) 400 kPa

$P_1V_1 = P_2V_2$

$100(25) = P_2(100)$

$P_2 = 25\ kPa$

5 The valve of an oxygen (O_2) cylinder is defective and the cylinder is leaking. The volume of the cylinder is 34 L. On Monday morning the technician had recorded a pressure of 452 kPa and a temperature of 23°C. Four days later the pressure was 402 kPa and the temperature was 18°C. **What was the mass of oxygen lost from the cylinder?**

$n = \frac{PV}{RT}$

$= \frac{(452)(34)}{(8.31)(296)}$

$= 6.25\ mol$

vs

$n = \frac{PV}{RT}$

$= \frac{(402)(34)}{(8.31)(291)}$

$= 5.65\ mol$

moles lost $6.25 - 5.65 = 0.60\ mol\ O_2$

$\frac{1\ mol}{0.60} = \frac{32.00}{x}$

$x = 19.2 \rightarrow 19\ g$

→ 0.23 L

6 At 100°C, a 230-mL flask contains 0.15 g of an elemental gas. A manometer indicates that the pressure exerted by this gas is 101.3 kPa. **Identify this gas.** (Pick the closest one.)

$PV = nRT$

$n = \frac{PV}{RT}$

$= \frac{(101.3)(0.23)}{(8.31)(373)} = 0.00751670 \text{ mol}$

$\frac{0.00751670 \text{ mol}}{1 \text{ mol}} = \frac{0.15 \text{ g}}{x}$

$x = 19.9556 \text{ g}$

SF 20 g/mol ⇒ Ne

7 A sample of chlorine gas, $Cl_{2(g)}$, occupies a volume of 600 mL at 40°C at a pressure of 250 kPa. **What is the mass of $Cl_{2(g)}$ in this container?**

$n = \frac{PV}{RT}$

$= \frac{(250)(0.6)}{(8.31)(313)} = 0.05767 \text{ mol } Cl_2$

$\frac{1 \text{ mol}}{0.05767} = \frac{70.9 \text{ g}}{x}$ $\quad x = 4.1 \text{ g } Cl_2$

8 A student had to produce 30.0 L of hydrogen gas, $H_{2(g)}$, at a 20.0°C and 101.3 kPa. To do this, he combined hydrochloric acid, $HCl_{(aq)}$, with calcium, $Ca_{(s)}$. According to this equation :

$Ca_{(s)} + 2HCl_{(aq)} \rightarrow H_{2(g)} + CaCl_{2(aq)}$ **What mass of calcium did the student use?**

$n = \frac{PV}{RT}$

$= \frac{(101.3)(30.0)}{(8.31)(293)}$

$n = 1.25 \text{ mol } H_2$

$1 \text{ mol } H_2 = 1 \text{ mol } Ca$

$\therefore 1.25 \text{ mol } Ca$

$\frac{1 \text{ mol Ca}}{1.25} = \frac{40.08 \text{ g}}{x}$

$x = 50.1 \text{ g Ca}$

9 A weather balloon whose volume on the ground where the temperature is -13°C & the pressure was 103kPa was 22.5 L rose to an altitude where the volume became 48.2 L and the temperature was -32°C. What was the pressure at this higher altitude?

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{(103)(22.5)}{260} = \frac{P_2(48.2)}{241}$

$P_2 = 45 \text{ kPa}$

10 Graham's Law

a) How much faster does He diffuse compared to O_2? He diffuses 2.83 times faster than O_2

b) Under a high temperature krypton diffuses at 10.00 m/s, how fast would iodine diffuse under the same conditions?

a) $\frac{V_1}{V_2} = \sqrt{\frac{M_2}{M_1}}$

$\frac{V_{He}}{V_{O_2}} = \sqrt{\frac{32.00}{4.00}}$

$= \sqrt{8}$

$\frac{V_{He}}{V_{O_2}} = 2.83$

b) $\frac{V_{Kr}}{V_{I_2}} = \frac{\sqrt{M_{I_2}}}{\sqrt{M_{Kr}}}$

$\frac{10.00}{x} = \frac{\sqrt{253.8}}{\sqrt{83.80}}$

$x = 5.756 \text{ m/s}$